
Ratings versus equity-based credit risk modelling: an empirical analysis

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In the last five years, many banks have implemented elaborate credit risk models in order to assess the risk of their corporate credit exposures. Such models provide a framework for calculating the joint distribution of future portfolio returns based on (i) consistent assumptions about the risks inherent in individual exposures and (ii) hypotheses about the degree of correlation between changes in the value of these exposures.

A major problem with credit risk models is that it is extremely difficult to assess the accuracy of the risk measures they supply. The models have not been implemented long enough for either firms or regulators to have much experience of their performance. Parameters are often based on relatively little information given the paucity of historical data on credit risk.

The present paper is the first to attempt a systematic back-testing exercise of credit risk models. Two models are implemented for large portfolios of dollar-denominated Eurobonds over an eleven-year period. Risk measures for a one-year investment horizon are calculated on a rolling basis for each successive month and then compared with the actual outcome for the change in the value of the portfolio in question over the following year. We are careful when we implement models to do so using data that would have been available at the relevant time.

The models we examine are canonical examples of ratings-based and equity-based approaches to credit risk

modelling. Ratings-based approaches such as JP Morgan's Creditmetrics framework suppose that the risk of credit exposures is summed up in their credit quality rating and model transitions between ratings categories for individual exposures and correlations between transitions for pairs of exposures. Equity-based models like those implemented by the consulting firm KMV suppose, as in Merton (1974), that the value of credit exposures are derivatives written on the firm's underlying asset value. The volatility and correlation structure of asset values are then deduced from the behaviour of changes in equity values.

Our major conclusion is that the two classes of models as commonly implemented significantly under-estimate the risks involved in holding our eurobond portfolios. The problems arise particularly when the models are implemented on portfolios of bonds issued by non-US domiciled obligors. The risk measures obtained for portfolios of bonds issued by US-domiciled obligors appear more consistent with the realised risks subsequently observed.

The implication of our analysis is not that credit risk models have no value. Rather it suggests (i) that models should be employed cautiously with conservative parameterisations, and (ii) that care should be taken when models are implemented for portfolios outside the standard case of US industrials for which reasonable amounts of historical data are available.